Wind Power Potential for State-owned Lands

Public listening sessions for
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Topics

About the UMass Wind Energy Center

Design of wind turbines and wind facilities

Common terminology

Assessing the wind resource

Siting Issues--technical and economic

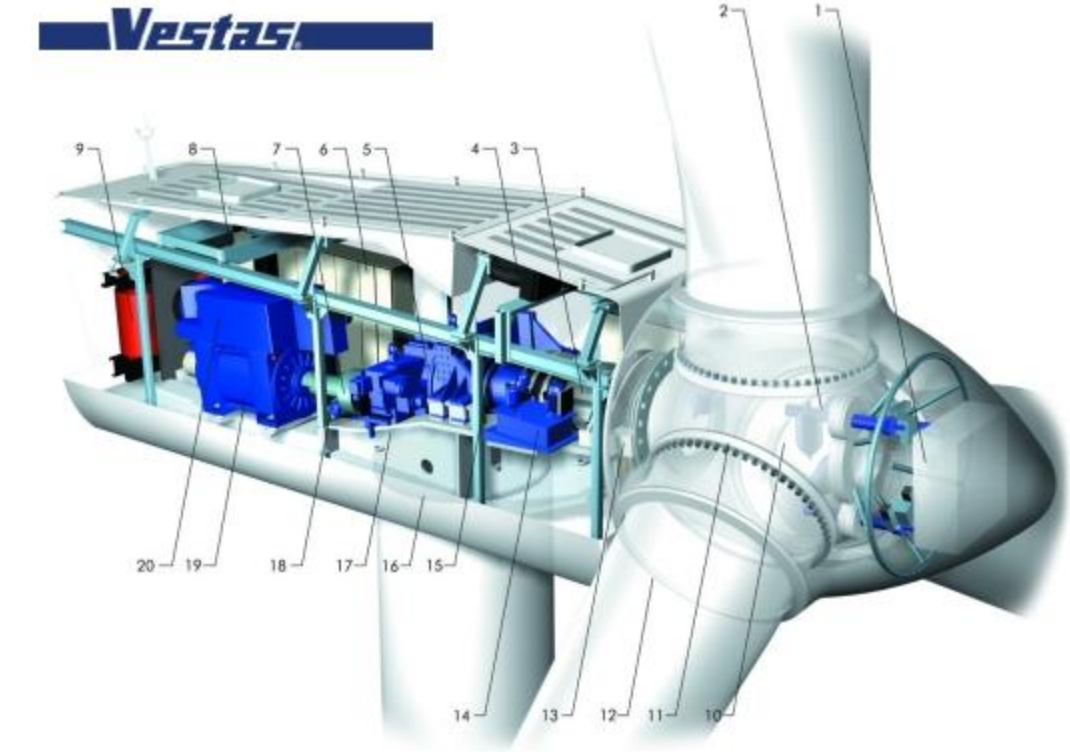
Siting Issues--environmental

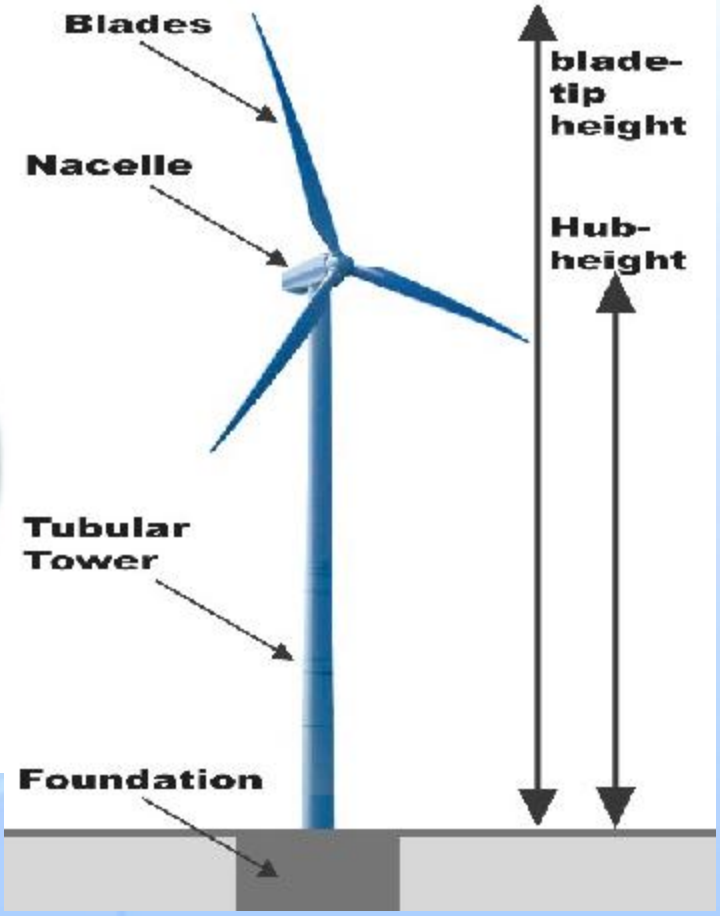
Where to get good, detailed information

About the Wind Energy Center

- The oldest wind energy engineering graduate program in the U.S.
- 4 faculty, 15 graduate students, and 6 staff.
- Assist the Commonwealth in wind siting, feasibility assessments, and technical studies.
- Original proposers of the Charlestown blade test center.
- Original prospectors of the wind energy resources in the Cape and Islands.
- www.umass.edu/windenergy

Design of wind turbines and wind facilities





Common wind turbine terminology

- Wind turbines consist of four main components—the rotor, transmission (gearbox), generator, yaw system, and control systems. Turbines can be direct drive (no gearbox) as well.
- The nacelle rotates (or yaws) according to the wind direction.
- Turbines can vary rotational speed, blade pitch, or both.
- Turbines deployed in multiple groups, called arrays, are arranged to avoid shadowing the wind from turbine to turbine.
- Turbines can be turned on and off remotely by an operator at a central control station.
- Turbines don’t spin unless the winds are sufficient to generate electricity, or in extreme winds associated with severe storms.

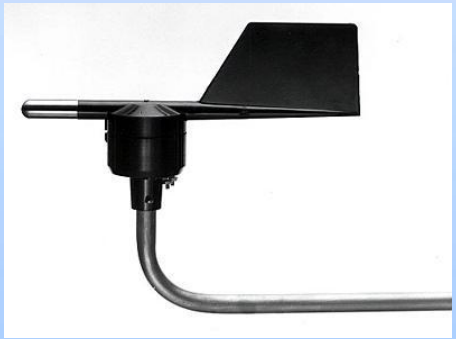
Other Important Wind Power Terminology

- **Turbine power rating** --the maximum instantaneous power output of the wind turbine, quoted in Watts. Typical value is 1.5 Megawatts (1.5 million Watts).
- **Turbine energy production** --a cumulative amount of energy produced by the wind turbine for a given period, usually a year. Quoted in kilowatt-hours (kWh) or megawatt-hours (MWh).
- **Capacity factor** --the average power output of the wind turbine, as a fraction of its power rating. A typical value is 28 percent. This reflects both the variability of the wind at a site and the efficiency of the turbine.
- **Average wind speed** --the long-term average speed of the wind, usually quoted in meters per second. (1 m/s = 2.24 mph). Typical value is 6 m/s.
- **Tower height** --the height of the turbine to the hub of the rotor, usually quoted in meters (1 meter = 3.28 feet) Roughly of a yard plus 10 percent. Typical values are 80 meters.
- **Wind shear** --the speed-up of wind with height, given as the exponent of a power-law equation. Typical low value--.15; high value--.30.
- **Turbulence intensity** --the roughness of the wind at a site. This is a dominant criteria for specifying a wind turbine. Typical low value--.15; high value--.30.

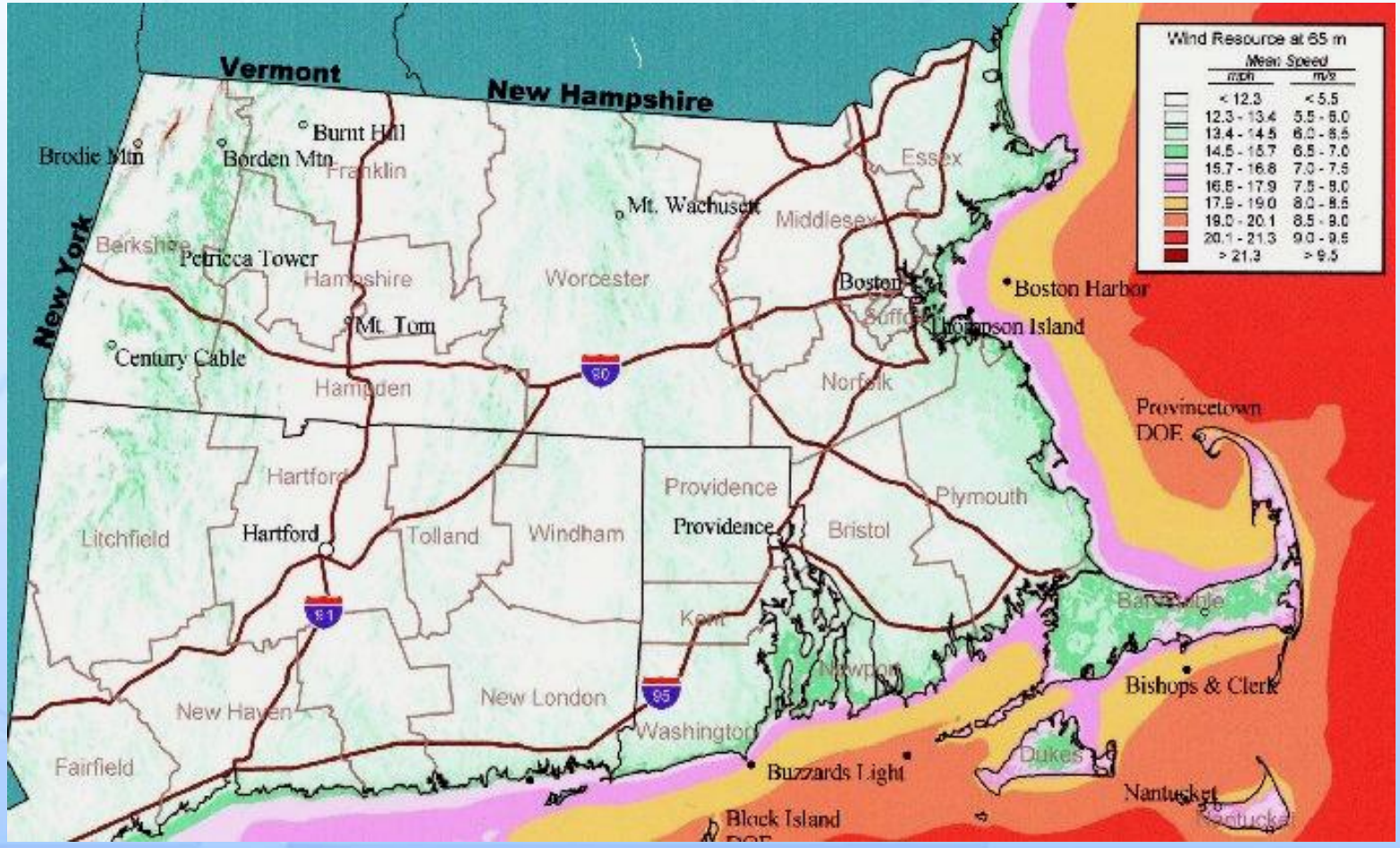
Assessing the wind resource

- Understand potential benefits
  - Energy production
  - Environmental benefit
  - Economic benefit
- i.e Reduce risk
- Community focus
- Spec & order equipment


Anemometer



Siting Issues-- technical and economic



Siting Issues--environmental

- Property Values
- Visual Aspects
- Noise
- Birds and Bats
- Shadow Flicker
- Net Environmental
- Global Benefits vs. Local Impacts

Where to get good, detailed information

- Wind Energy Center
  - Community Wind Fact sheets: www.umass.edu/windenergy/
  - 413-545-4359
- www.windpower.org
  - Lots of accessible, technical information
- Others:
  - AWEA: www.awea.org
  - Wind Power America: www. windpoweringamerica.gov
  - Utility Wind Interest Group : www.uwig.org
  - Links: www.fresh-energy.org
  - Database of State Incentives for R.E.: www.dsireusa.org
  - NREL Publications Database: http://www.nrel.gov/publications